

KARPENKO, G.V.

The December session of the Academy of Sciences of the Ukrainian  
S.S.R. Visnyk AN URSS 21 no.1:58-63 Ja '49. (MLRA 9:9)

1. Vcheniy sekretar prezidii AN URSS.  
(Academy of Sciences of the Ukrainian S.S.R.)

KARPENKO, G.V.

In the Presidium of the Academy of Sciences of the Ukrainian S.S.R.  
Visnyk AN URSR 21 no.2:75-76 P '49.  
(Academy of Sciences of the Ukrainian S.S.R.) (MLRA 9:9)

KARPENKO G. V.

181T1

USSR/Academy of Sciences - Ukrainian SSR Mar 50

"In Presidium of the Academy of Sciences of the Ukrainian SSR," G. V. Karpenko

"Visnyk Ak Nauk Ukrain's'koy RSR" No 3, pp 74-76

Evaluates 1949 sci activity on basis of reports delivered to Presidium of Acad Sci Ukrainian SSR by Sec of Physicomath, Chem, Agr, and Social Sci. Numbers of sci reports, publications, lectures and consultations are given.

LC

181T1

KARPENKO, G. V.

Journal of the Iron and Steel Institute  
Vol. 176 Part 3  
Mar. 1954  
Properties and Tests

Effect of Surface-Active Substances on the Fatigue Limit of Metals. G. V. Karpenko. (Zavodskaya Laboratoriya, 1950, 18, (8), 984-985). [In Russian]. In the experiments described, the fatigue limits of specimens of a chromium and a carbon steel were determined in air and in various surface active substances. The fatigue limit of the chromium steel decreased by 16% and 44% respectively when the specimen was immersed in castor oil and a 2% aqueous solution of iso-amyl alcohol. For carbon steel in alcohol, the reduction was 15%. Almost the same effects were produced by 0.5% iso-amyl alcohol solution. Greater effect on fatigue limits was produced by surface active substances on ground and heat-treated, than on turned, specimens.—G. K.

KARPENKO, G. V.

Academy of Sciences of the Ukrainian S.S.R.

Presidium of the Academy of Sciences of the Ukrainian S.S.R. during September Visnyk  
AN URSU 22 No. 10, Oct. 1950

Monthly List of Russian Accessions, Library of Congress, August, 1952. UNCLASSIFIED.

9

*Effect of surface-active substances on the fatigue of steel*  
G. V. Karpenko, *Doklady Akad. Nauk S.S.S.R.* 73, 1225-8 (1950).—The curve of the fatigue strength  $\sigma$  of a perlite-ferrite steel, showing in air the normal behavior of a limiting const.  $\sigma$  as a function of the no. of cycles  $N$  (at const.  $n = 10,000$  cycles/min.), shows a steady fall of  $\sigma$  with increasing  $N$ , without const. limit, in a corrosive medium,  $H_2O$ . With 0.2%-2% AmOH added to the  $H_2O$ , the normal shape and the limiting const.  $\sigma$  are restored. Increase of the concn. of the AmOH from 0.2 to 2% has little effect. The action of the surface-active AmOH consists in adsorptive lowering of the resistance to deformation, and inhibition of the corrosive action of  $H_2O$  through adsorptive passivation. With a tempered sorbitic steel, at  $n = 2840$  cycles/min., addn. of 0.2% AmOH to distil.  $H_2O$  lowered the limiting const.  $\sigma$  by 42%. While a lubricating oil lowered the limiting  $\sigma$  of that steel by 7.5%, the same oil with 2% oleic acid added produced a lowering by 19%. While  $n$  has no significant effect on the limiting  $\sigma$  in tests in air, the lowering of  $\sigma$  in a surface-active medium increases with decreasing  $n$ . Thus, with the perlite-ferrite steel, addn. of 2% AmOH to  $H_2O$  lowered  $\sigma$  by 7% at  $n = 10,000$ , and by 30% at  $n = 3000$ . An inactive paraffin oil with 2% oleic acid lowered  $\sigma$  by 5% at  $n = 3000$ , and by 7% at 1500. This is taken to indicate that the penetration of the surface-active substance into the microcracks proceeds with a finite velocity, and that, at too high  $n$ , the time during which the microcracks are pried open is too short for the substance to penetrate. The effect of the surface-active substances is greater on quenched steels, and greater on polished than on rough surfaces. N. Thon

KARPENKO, G. V.

PA 174T39

USSR/Metals - Steel, Physical Chemistry of 1 Sep 50

"Concerning the Problem of the Formation of Microcracks From Fatigue," G. V. Karpenko, Inst of Constr Mech, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXIV, No 1, pp 95-98

Surface energy of solid, and distribution over surface influence appearance of slips which precede formation of fatigue cracks. Shows varied processing of solid, establishing surface ultramicrogeom, causes varied

174T39

USSR/Metals - Steel, Physical Chemistry of (Contd) 1 Sep 50

distribution of surface energy and varying conditions for formation of fatigue microcracks and for effect of surface-active substances on this process. Submitted by Acad P. A. Reblinder.

174T39

KARPENKO, G.V.

USSR

4811 AEC-tr-2146  
SELECTIVITY IN THE FORMATION OF FATIGUE CRACKS  
DURING THE WORKING OF STEEL IN A CORROSIVE  
MEDIUM. (Pro Vibirulst' v Utvorenni Trishchlin Vtomi pri  
Roboti Stali u Korozivnomu Seredivishchi). G. V. Karpenko  
Translated by S. Reiss from: Dopovidi Akad. Nauk Ukr.  
R.S.R., 112-15(1951). 5p. ADSORPTIVE BEGINNING OF  
THE CORROSIVE FATIGUE OF METALS. (Adsorbtivnyi  
Pochatok Korozivnoi Vtomi Metaliv). G. V. Karpenko  
Translated by S. Reiss. Ibid. 116-19(1951). 7p.

M  
JGP

Resolution B-75777



KARPENKO, G. V.

"Adsorption as the Origin of Corrosion Fatigue of Metals," Dop. Ak Nauk URSR,  
No 2, pp 116-119, 1951

B-75777

| 1ST AND 2ND ORDERS  |  |  |  |  |  |  |  |  |  | 3RD AND 4TH ORDERS |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|
| PROCESSES AND PROPERTIES INDEX  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |  |  |  |  |  |
| <p>21</p> <p>The Influence of Active Substances on the Surface of Metal Parts on Their Fatigue Limit. (I. V. Karpenko. (Zavodskaya Laboratoriya; Hutnické Listy, 1951, vol. 6, Mar., p. 148). [In Czech]. The author criticizes the practice of fatigue testing in air applied to parts which are to operate in oil. Fatigue tests were made at 2840 cycles/min. on Kh40 steel (C 0.04%, Cr 0.93%, Ni 0.40% max.). The fatigue limits in castor oil were about 16% lower than in dry air, and the values for specimens in a 2% solution of iso-amyl-alcohol were about 44% lower than the corresponding values in dry air. Carbon steels were tested in dry air and iso-amylalcohol solutions at 10,000 cycles/min. The values in the latter were about 13% lower than in the former. The influence of the surface quality of the part and the concentration of the working medium were also examined. Ground surfaces are more sensitive to this effect than turned parts and heat-treated parts are more sensitive than those not heat-treated. Even very low concentrations of surface-active substances in lubricating oil cause a decrease in the fatigue limit of the lubricated part.—S. O. J.</p> |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |  |  |  |  |  |
| ASME-ISA METALLURGICAL LITERATURE CLASSIFICATION  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |  |  |  |  |  |
| SIGN: 17100114  |  |  |  |  |  |  |  |  |  | SIGN: 601174       |  |  |  |  |  |  |  |  |  |
| 147002 * 1  |  |  |  |  |  |  |  |  |  | 147002 * 1         |  |  |  |  |  |  |  |  |  |
| 147002 * 1  |  |  |  |  |  |  |  |  |  | 147002 * 1         |  |  |  |  |  |  |  |  |  |

KARPENKO, G.V.

Strength of coal. Sbor. trud. Inst. stroi. mekh. AN URSR no.15:  
151-164 '51. (MIRA 11:4)  
(Coal--Testing)

24

5

KARPENKO, G. V.

**The Mechanism of Corrosion Fatigue.** G. V. Karpenko. (Doklady Akademii Nauk, U.S.S.R., 1951, vol. 77, No. 5, pp. 827-830). (In Russian). The mechanism of corrosion under the influence of alternating load in a corrosive medium is discussed. The author believes that corrosion fatigue consists of two consecutive processes: (1) The development of microcracks whose formation is accelerated by the absorption of ions; and (2) the true corrosion process (electrochemical corrosion) inside these cracks which makes them grow. The first process causes the formation of a great number of microcracks which are orientated perpendicularly to the active stresses. This mechanism explains the selectivity of "deep corrosion," preferential formation of transcrystalline cracks, and the impossibility of complete protection. Protection stops the electrochemical process of corrosion inside cracks - V. O.

Secton Dispersed Systems, Inst. Phys. Chem., AS USSR

ABSTRACT METALLURGICAL LITERATURE CLASSIFICATION

KARPENKO, G. V.

USSR/Metals - Steel, Corrosion

11 Jul 51

"Concerning Corrosion Fatigue," G. V. Karpenko,  
Inst of Phys Chem, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXIX, No 2, pp 287, 288

X Gives addnl exptl data on mechanism of corrosion  
fatigue supplementing previous paper published in  
"Dok Ak Nauk SSSR." Vol LXXVII, No 5, 1951. Em-  
phasis was made on investigation of adsorption ef-  
fect in process of corrosion fatigue, using 1% aq  
soln of saponin as corrosive medium. Specimens  
with zinc protectors were employed in tests. Sub-  
mitted by Acad P. A. Rebinder 7 May 51.

214T62

KARPENKO, G. V.

# USSR

Influence of the cooling medium on the strength of steel.  
G. V. Karpenko, G. V. Isachenko, and L. A. Mikhova. *Tr. Vsesoyuzn. nauch. issled. inst. mashinostroyeniya*, 1957, 40-41 (Russian summary), 4341. 22 p. 25 cm. 14824. In a previous paper the effect of abrasive and corrosive medium on the strength of steel was shown. The present experiments were carried out in a medium such as air, water, or oil, which dissipate heat from steel. Such media, which decrease the temp. above the tensile strength, increase the strength of cyclic over-loaded steel plates and do not affect the fatigue of steel. M. C. J.

KARPENKO, G. V.

USSR.

V. Corrosion-fatigue limit. G. V. Karpenko. Doklady Akad. Nauk S.S.S.R. 87, 817-818 (1983) ref. 62. 45, 85801, 49, 87781. The purpose of the article is to det. whether metals submitted to corrosion-fatigue exhibit a fatigue limit in the proper sense of the word. Expts. were performed on different steels which had undergone various heat-treatments. The samples had different surface states. It was shown that for all samples the resistance to fatigue decreases with the no. of alternations. The rate of decrease depends on the nature of the steel, the aggressiveness of the soln., the frequency of the alternations, and the surface state of the sample. The total time of exposure to the corrosive medium and the frequency of alternations are the factors detg. the resistance to fatigue. Theoretical considerations on the mechanism of corrosion-fatigue lead to the conclusion that under the effect of corrosion, fatigue may cause failure under any load. Theoretically, therefore, no real fatigue limit exists. For practical purposes one can define corrosion-fatigue limit as the load for which occurs an abrupt decrease of the rate of resistance to fatigue, provided one specifies the no. and the frequency of alternations, the nature of the corrosive medium, and the surface state of the metal. Micrographs of samples showing the development of fatigue cracks illustrate the article. N. Goldowski

62

Inst. Phys. Chem., AS USSR

Karpenko, G. V.

USSR •

Influence of frequency of stress change on endurance of steel when used in surface-active and corrosion-active media: G. V. Karpenko. Doklady Akad. Nauk S.S.S.R. 87, 707-709 (1962); ~~ibid.~~ C.A. 45, 1482b. — Fatigue-testing machines are commonly based on the amplitude of cyclic stress change caused by the frequency of reversals of up to 1000 cycles per sec. Within this range of frequency, in a nonactive gaseous medium, and in the absence of concd. stresses, the endurance limit of steel is independent of frequency. Above that frequency, the endurance limit changes to some extent. Nothing is known about the influence of frequency when the test is made in a medium that is surface-active or corrosion-active. With cylindrical samples, 7.62 mm. in diam., of a Russian steel (20X).

Div. Dispensed Systems,  
Inst. Phys. Chem., AS USSR



having a pearlitic-ferritic structure in a fatigue-testing machine operating to give pure bending, at frequencies from 300 to 10,000 cycles per min., endurance tests were made in the following active media: nonpolar solns. contg. a surface-active substance (MS oil + 2% oleic acid); polar soln. contg. a surface-active substance (water + 2% lauryl alc.); and aerated water as a corrosion medium. The criterion used to show the influence of frequency on fatigue endurance was the ratio of the endurance limits in the medium and in air, expressed as a percentage. The results showed that in surface-active media, the plot of this criterion against cycles per min. as abscissa, is the same as for non-surface-active media, except that the curves lie at lower endurance values. For corrosion-active media, the same steel was tested in aerated water (pH 6) at frequencies of 2,000, 3,000, and 10,000 cycles per min., but the curves are plotted to show the value of the criterion against total no. of cycles. This plot for endurance in corrosion-active media shows a decrease which becomes linear in the range  $5 \times 10^4$  to  $20 \times 10^4$  cycles and is less, the higher the frequency. The same criteria for steel in corrosion-active media are plotted against time (0-200 hrs.)

V. H. Gottschalk

211

KARPENKO G.V.

KARPENKO, G.V.

Qualitative modifications in steel subjected to "adsorption"- and  
corrosionfatigue processes. Nauch.zap. IMA L'viv.fil AN URSR 2  
no.1:64-83 '53.

(MLRA 8:11)

(Steel--Fatigue)

KARPENKO, G. V.

KARPENKO, G. V.; ISHCHENKO, I. I.

Residual compression stresses as a method of controlling "adsorption"  
and corrosion fatigue in steel. Nauch.zap. IMA L'viv AN URSR 2 no.1:  
84-93 '53. (MLRA 8:11)  
(Steel--Fatigue) (Strains and stresses)

KARPENKO, G.V.

Lubricating oils as an agent reducing the strength of steel.  
Sbor.trud.Inst.stroi.mekh.AN URSR no.18:116-133 '53. (MLRA 9:8)  
(Steel--Corrosion)

KARPENKO, G. V.

3 Influence of the absolute dimensions of samples on the adsorptive and corrosion fatigue of steel. G. V. Karpenko and A. V. Karmanov. *Doklady Akad. Nauk SSSR*, 74, 603-61 (1983). — The fatigue limit (1) of a perlite-ferrite steel (C 0.15; Si 0.2; Mn 0.55; Cr 0.58; P 0.023; S 0.027) in air decreased with an increase in the test specimen dimensions, e.g. by 10% with increase in diam. from 10 to 40 mm. The limit in a mineral oil which contained oleic acid was slightly less than in air, and decreased more slowly with the specimen size. In river water, it was markedly lower than in air, and increased with the specimen size, e.g. from 12.5 kg per sq. mm, with the 10-mm specimen to 15.7 at 40 mm. diam., at  $2 \times 10^6$  cycles. Andrew Dravitski

Inst. Machine Construction  
+ automation, AS Ukr. SSR

KARPENKO, G.V.

LIKHTMAN, V.I.; REBINDER, P.A.; KARPENKO, G.V.; YEGOROV, N.G., redaktor;  
NEVRAYEVA, N.A., tekhnicheskii redaktor

[Effect of a surface-active medium on processes of metal deformation]  
Vliianie poverkhnostno-aktivnoi sredy na protsessy deformatsii metal-  
lov. Moskva, Izd-vo Akademii nauk SSSR, 1954. 206 p. (MIRA 8:4)  
(Deformation (Mechanics)) (Metals)

Karpent, G. U.

Adsorption and corrosive effects of liquid media on the resistance of steel. G. V. Karpent, Nauch. Zispihi Inst. Mashinost. i Avtomat. Kaza. Nauch. Upr. S.S.R., Vopr. Mashinost. i Prochnost. Mashinostroen. 3, No. 2, 17-28 (1964). Referat Zhur., Khim. 1955, No. 4009. Effect of lubricating oils, activated mineral oils, water, and some aqueous solutions on the cyclic strength of Cr steels 20Kh, 40Kh, and 50Kh 18 in their hardened and annealed state were studied. The resistance of the steels in these media were compared to their resistance in air. In chemically neutral media containing surface active substances the resistance of steel was lowered. The adsorption factor of the lowered resistance depended very little on the make of the steel, its structure, or hardness. This factor acted continuously and was independent of time. Therefore, in the case of adsorption fatigue the limit of resistance could be determined. In corrosion fatigue the lowering of resistance depended on time and, therefore, there was no limit to corrosion fatigue. In this investigation the resistance to corrosion fatigue increased with increasing annealing temp. and decreased with increasing strength and hardness of steel. M. Hosen

YAN of LPH

7000

*KARPENKO, G.V.*  
KARPENKO, G.V.

Mechanism of "adsorption" fatigue in metals. Nauch. zap. IMA L'viv  
fil. AN URSR. Ser. mash. 3 no. 2:29-39 '54. (MLRA 8:11)  
(Steel--Fatigue)



KARPENKO, G.V.

Training scientific workers in the Institute of Mechanical Engineering  
and Automatic Control of the Lvov branch of the Academy of Sciences  
of the Ukrainian S.S.R. Vianyok AN URSS 25 no.10:65-67 0 '54.(MLBA 8:1)

1. Direktor Institutu mashinoznavstva i avtomatiki AN Ussr.  
(Ukraine--Technical education)

KARPENKO, G. V.

USSR/Physics Techn. Physics

Card : 1/1

Authors : Karpenko, G. V.

Title : Effect of surface-active substances on the damping decrement of oscillations in steel

Periodical : Dokl. AN SSSR, 97, Ed. 1, 81 - 83, July 1954

Abstract : The effect of surface-active substances on the oscillation-damping process was explained by testing a ShKh-15 steel sample in a Malashenko fatigue-testing machine. The results obtained are explained by the changes in oscillation characteristics in the tested article. Seven USSR references. Table, graph.

Institution : Acad. of Sc. Ukr-SSR, Institute of Machine Construction and Automatics, Lvov.

Presented by : Academician, P. A. Rebinder, April 2, 1954

KARPENKO, G.V., doktor tekhnicheskikh nauk, professor, redaktor; SAVIN, G.N. redaktor; LOPATINSKIY, Ya.B., redaktor; LEONOV, M.Ya., doktor fiziko-matematicheskikh nauk, redaktor; MIKHAYLOVSKIY, V.N., kandidat tekhnicheskikh nauk, redaktor; PARASYUK, O.S., kandidat fiziko-matematicheskikh nauk, redaktor; PANASYUK, V.V., kandidat fiziko-matematicheskikh nauk, redaktor; ZIL'BAN, M.S., redaktor; RAKHLINA, N.P., tekhnicheskii redaktor

[Some problems in the fatigue of steel with calculation of the influence of active agents] Nekotorye voprosy ustalostnoi prochnosti stali s uchetom vliianiia aktivnoi sredy. Kiev, Izd-vo Akademii nauk USSR, 1955. 48 p. (MLRA 9:3)

1. Akademiya nauk URSS, Kiyev. Institut mashinostroyeniya i avtomatiki.
2. Deystvitel'nyy chlen AN USSR (for Savin) J. Chlen-korrespondent AN USSR (for Lopatinskiy) (Steel--Fatigue)

KARPENKO, Georgiy Vladimirovich, professor, doktor tekhnicheskikh nauk  
REBINDER, P.A., akademik, redaktor; KAZANTSKY, B.A., redaktor; RAKHLINA,  
N.P., tekhnicheskii redaktor

[Effect of active liquid media on the strength of steel] Vliianie  
aktivnykh zhidkikh sred na vyнослиvost' stali. Kiev, Izd-vo Akademii  
nauk Ukrainsskoi SSR, 1955. 205 p. (MLBA 9:3)  
(Steel--Testing)

Karpenko, G. V.

4  
4F1  
4E2C

The effect of the condition of the surface upon the adsorptive and corrosive fatigue of steel. G. V. Karpenko. *Nekotorye Voprosy Otkrytiya Prakhovogo i Korrozionnogo Vliyaniya Atmosfery* (Kiev: Akad. Nauk Ukr. S.S.R.) *Sbornik 1955. Referat. Zhur. Mez. 1956, Absit. No. 18/60, 4. C.A. 50, 4781b.*

The contour and the heterogeneity of force field in surface layer produce intense adsorptive and corrosive fatigue processes in ultramicroscopic cracks and ultimately effect the endurance in liquid media, where the fatigue cracks start exclusively from the surface. Phys. and mech. properties of surface are affected by the variation of grains and crystals which have different levels of surface energy. The physicochem. state of the surface covered by a film of oxides changes the course of adsorptive processes, and protects it from the development of corrosion.

A. N. Petukh

11  
8-28

KARPENKO, G. V.

18  
Effect of the medium on the fatigue strength of steel under stress. G. V. Karpenko, P. A. Mikhailov, L. I. Ishchenko, and E. P. Vannitskii. *Nicholovskii Vestnik. Usploshchennye Prochnost' Stal' i Uchastok Vysokogo Atmospfer (Kiev. Akad. Nauk Ukr. S.S.R.)* 1953, 20-30. *Referat Zhur.* May 1954, No. 6647. Stresses were produced by steel by means of similar grooves of different profiles. The effect of these stresses on the endurance limit of the steel varies with the surrounding medium; the limit decreases most in air. A corrosive medium decreases the effect of the stresses by producing weakened sections in the metal. A. N. P.

5  
1/1  
4E2C  
125

KARPENKO, G. V.

Effect of surface-active materials on cycle durability of  
 steels. G. V. Karpenko. Dokl. Akad. Nauk, Ukr. S.S.R., Ser. Mashinost.  
 i Aviatstb. Akad. Nauk, Ukr. S.S.R., Ser. Mashinost.  
 i Aviatstb., No. 1, 45-46 (1956); Russ. Transl., Izv. Akad. Nauk, No. 1957.  
 Surface-active materials such as lubricating greases containing  
 10% oleic acid have an effect on the process of fatigue of  
 quenched martensitic steel StKh17 only after extended cy-  
 cle loading of specimen at stresses close to  $\sigma_{-1}$ , raising the  
 significance of decrement and speeding fatigue failure. In  
 air, the first crack formed after  $4.3 \times 10^6$  cycles, in surface-  
 active material, after  $1.3 \times 10^6$  cycles.

R.M. R.M.

ab



KARPENKO, G. V.

18. 18. 4E2C  
 The nature of corrosion fatigue in steel, G. V. Karpenko, *Nauch. zapiski Vuz. Mashinostroyeniye*, No. 3, 100-101 (1955); *Russk. Zhur. Khim.* 1956, Abstr. No. 14829.  
 After studying the process of corrosion fatigue of steel (CF) as well as measures of fighting this phenomenon, K. proposes the following adsorptional physicochem. hypothesis: after an application of a continuous load, displacements occur in the strained to the max. grains, owing to formation of ultramicrocracks (UMC). The adsorption of surface-active elements of the medium inside UMC accelerates their development and increases their no.; this in turn causes an increased no. of displacements and speeds up their formation. Inside of the UMC and ruptures, a corrosion process takes place, intensifying in places of stress concn. Corrosion stresses appear as a result of the loosening action of corrosion products. Concent. stresses accelerate corrosion owing to damaging of the oxide films. Thus, K. divides the CF process into a primary adsorption action promoting the formation of UMC under the influence of a const. load, and a secondary electrochem. process inside the forming cracks. K. assumes that no connection exists between the speed of development of UMC and a surface corrosion process and that anodic polarization has no influence on the progress of CF.  
 J. Mrozynska



KARPENKO, G.V., MIKHAYLOV, P.A., ISHCHENKO, I.I.

Simultaneous effect on the fatigue strength of steel of concentrated stress and surface active media. Dop. AN URSR no.5:  
444-447 '55. (MLRA 9:3)

1. Institut mashinovedeniya ta avtomatiki AN URSR. Predstaviv  
diysniy chlen AN URSR G.M. Savin.  
(Steel--Fatigue)(Elasticity)

KARPENKO, G.V.; YANCHISHIN, F.P.

On the simultaneous effect of corrosive agents and stress concentration  
on steel strength. Dop.AN URSR no.6:525-528 '55. (MLRA 9:7)

1.Institut mashinoznaystva ta avtomatiki AN URSR. Predstaviv diyanly  
chlen AN URSR G.M.Savin.  
(Steel--Testing)

*KARPENKO, G.V.*

KARPENKO, G.V.

In the Institute of Mechanical Engineering and Automatics of the  
Academy of Sciences of the Ukrainian S.S.R. Visnyk AN URSS 26  
no.1:69-70 Ja '55. (MLRA 8:3)  
(Mechanical engineering) (Automatic control)

KARPENKO, G.V., doktor tekhnicheskikh nauk, professor.

Greative cooperation with production. Visnyk AN URSR 26 no.7:  
71-73 J1'55. (MIRA 8:10)

1. Direktor Institutu mashinoznavstva ta avtomatiki Akademii nauk  
URSR.

(Academy of sciences of the Ukrainian SSR.)

KARPENKO, G.V.

Power engineering of the future (based on materials of the International Conference on the Peaceful Use of Atomic Energy). Visnyk AN URSR 26 no.9: 52-55. S'55. (MIRA 8:11)

(Atomic power)

KARPENKO, G.

Utilization of atomic energy for industrial purposes. Tr. from the Russian.  
p. 4. Vol. 7, no. 3/4, Mar./Apr. 1956. ELEKTRONENERGIJA. Sofiya.

SOURCE: East European Accessions List. (EEAL) Library of Congress.  
Vol. 5, No. 8, August 1956.

KARPENKO, G.V., doktor tekhnicheskikh nauk, professor.; YATSYUK, A.I.,  
inzhener.

Effect of power cutting on steel endurance. Vest.mash. 36 no.10:  
32-34 0 '56. (MLRA 9:11)  
(Steel--Testing) (Metal cutting)

S/123/59/000/09/01/036  
A002/A001

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1959, No. 9, pp.11-12,  
# 32853

AUTHOR: Karpenko, G. V.

TITLE: On the Universality of the Adsorption Effect in Metal Strength  
Reduction 1

PERIODICAL: V sb.: Issled. po fiz. tverdogo tela, Moscow, AN SSSR, 1957,  
pp. 273-278

TEXT: As a result of the adsorption interaction between an external medium and a metal under strain, the resistance of the metal to deformation and breakdown decreases, the yield limit of single crystals is reduced, and the creep rate increases. The adsorption of surface-active elements from the surrounding medium on the surface of steel causes a decrease of the fatigue strength of the latter. The presence of a variety of imperfections mainly ultramicroscopic ones, usually concentrated in areas which are regarded as weak-spots in crystallo-chemical respect, is of special importance for the inter-

Card 1/2

✓B



S/123/59/000/09/01/036  
A002/A001

On the Universality of the Adsorption Effect in Metal Strength Reduction

action of a metal under strain and the external medium.

Translator's note: This is the full translation of the original Russian abstract.

B. A. M.

✓B

Card 2/2

KARPENKO, G.V.; YATSYUK, A.I.

Effect of mechanical processing of steel on its fatigue strength.  
[with summary in English]. Dop. AN URSR no.1:23-26 '57. (MLRA 10:4)

1. Institut mashinostroyeniya i avtomatiki AN URSR. Predstaviv akademik  
AN URSR G. M. Savin.  
(Steel--Fatigue)

KARPENKO, G.V. (L'viv)

**Destruction of metals in contact with liquid metals [with  
summary in English].** Prykl. mekh. 3 no.1:13-19 '57. (MLRA 10:5)

1. Institut mashinoznavstva ta avtomatiki AN URSR.  
(Mercury--Metallurgy) (Duralumin--Metallurgy)  
(Brass--Metallurgy)

SOV/137-57-10-20349

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 278 (USSR)

AUTHORS: Karpenko, G.V., Yatsyuk, A.I., Yanchishin, F.P.

TITLE: Influence of Mercury Upon the Strength and Fatigue Strength of Structural Materials (Vliyaniye rtuti na prochnost' i vyнослиvost' konstruktsionnykh materialov)

PERIODICAL: Nauchn. zap. In-ta mashinoved. i avtomatiki. AN UkrSSR, 1957, Vol 6, pp 42-49

ABSTRACT: An investigation is made of the influence of Hg (amalgamation) upon the mechanical properties of steel, brass, and duralumin. It is found by tensile testing that liquid Hg significantly reduces the  $\sigma_b$  of specimens of brass (by 32%), while that of duralumin drops by 12%, and the  $\delta$  of brass and duralumin drops to 0. Liquid Hg has no influence whatever upon polished 20Kh steel and red copper. Fatigue strength is considerably reduced in testing by cyclic loading. Surface rolling of the specimens results in a considerable increase in their fatigue strength both in Hg and in air. The authors hold that the decline in mechanical properties is due to the penetration of the Hg, via a system of defects, into specimens that have not had surface

Card 1/2

SOV/137-57-10-20349

Influence of Mercury Upon the Strength (cont.)

rolling. The Rebinder adsorptive-cleavage effect makes it appearance under these conditions. Surface rolling closes all the surface defects, and this renders the metal insusceptible to the action of Hg.

P.N.

Card 2/2

KARPENKO, G.V.

AUTHOR: Karpenko, G.V., Doctor of Technical Sciences, Professor,  
and Tynnyy, A.M., Babey, Yu.I., Engineers. 122-2-13/23

TITLE: On the depth of the sulphur-enriched layer in the sulph-  
iding of steel and cast iron (O glubine sloya, obogashch-  
ennogo seroy pri sul'fidirovanii stali i chuguna)

PERIODICAL: "Vestnik Mashinostroyeniya" (Engineering Journal),  
1957, No. 2, pp. 61 - 62 (U.S.S.R.)

ABSTRACT: Medium temperature (540 - 570 C) sulphiding in a solid,  
liquid or gas medium has been claimed by the Minsk Motorcar  
Plant (Minskiy Avtozavod) to produce sulphur diffusion to a  
depth of up to 0.3 mm and to yield a better wear resistance  
in tools and machine components. These claims were examined  
by the use of the radio-active S35 having a beta radiation of  
0.17 MeV. The test technique is described. 0.0021% of radio-  
active FeS was added to the FeS in the sulphiding bath (con-  
taining 13.2% FeS). The tests show sulphur penetration to a  
depth of 16  $\mu$  in steel and 30  $\mu$  in cast iron. The wear res-  
istance due to the anti-friction and anti-seizure properties  
of sulphur is restricted to this thin layer.

Card 1/1 There are 2 figures, including 1 graph and 4 Slavic references.

AVAILABLE: Library of Congress

AUTHOR: KARPENKO, G. V. PA - 2768  
 TITLE: Role of the Hydrogen Absorption in the Corrosion Fatigue of Steel.  
 (Rol' navodorazhivaniya pri korrozionnoy ustalosti stali, Russian)  
 PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 4, pp 850-852 (U.S.S.R.)  
 Received: 6 / 1957 Reviewed: 7 / 1957  
 ABSTRACT: In previous works the author developed absorption-electrochemical  
 conceptions on the corrosion fatigue of steel. The present paper in-  
 vestigates this kind of fatigue of steel in the case of high stress  
 amplitudes. In the case of simultaneously acting and repeatedly  
 changing stresses absorption-, diffusion-, and corrosion phenomena  
 occur in the metal, which are discussed in detail. Atomic hydrogen,  
 which is reduced on metal, diffuses into the metal lattice, saturates  
 it (on which occasion hydrides may be formed), and causes hydrogen  
 brittleness. In the case of the metal deformation and hydrogen con-  
 tamination of sufficiently deep domains of metal, hydrogen penetrates  
 into the depths along the surfaces of the shift with great rapidity.  
 On the occasion of the tests carried out samples of soft steel formed  
 cathodes and anodes in acid electrolyte and were at the same time  
 stretched on a tensile-testing machine for 1-2 minutes up to breaking  
 point. This led to the brittle destruction of the cathode of plastic  
 steel along the surfaces of displacement (illustration 1 a), on which  
 occasion strength was reduced by about 10%, while the real stresses  
 were reduced by about the double. The anodes did not change at all

Card 1/2

PA - 2768  
Role of the Hydrogen Absorption in the Corrosion Fatigue of Steel.

and were torn in exactly the same manner as in the air. Also in the case of a copper anode and a steel cathode, when no hydrogen was deposited on the latter, the aforementioned phenomena were not observed. The great rapidity of saturation with hydrogen was astonishing. The experiments carried out by the author lead one to suppose that in the case of such polycrystalline metals like steel, which have a great number of micro-cathode and micro-anode points on the boundary between the metal and the milieu, the saturation of cathode points with hydrogen takes place very rapidly under the given conditions. (1 Illustration and 4 Citations from Slav Publications).

ASSOCIATION: Institute for Machine Science and Automatics of the Academy of  
Science of the Ukrainian SSR, Lemberg  
PRESENTED BY: P.A.REBINDER, member of the Academy  
SUBMITTED: 18.10.1956  
AVAILABLE: Library of Congress

Card 2/2



KARPENKO, Georgiy Vladimirovich; YATSYUK, Arseniy Ivanovich; ISHCHENKO, I.I.,  
kand. tekhn. nauk, vidp. red.; KISINA, I.V., red. vid-vo;  
SKLYAROVA, V.E., tekhn. red.

[Effect of surface working upon the strength of steel in active  
liquid media] Vplyv obrobky poverkhni na vtomnu mitsnist' stali v  
aktyvnykh ridynnykh seredovyshchakh. Kyiv, Vyd-vo Akad. nauk  
URSR, 1958. 113 p. (MIRA 11:7)

(Steel) (Metal cutting)

KARPENKO, G. V.

5(4)

PHASE I BOOK EXPLOITATION

SOV/2610

Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva ta avtomatyky

Deyaki pytannya fizyko-khimichnoyi mekhaniky metaliv  
(Physical, Chemical, and Mechanical Properties of Metals)  
Kyiv, 1958. 142 p. 1,000 copies printed.

Resp. Ed.: H.V. Karpenko, Doctor of Technical Sciences; Ed. of  
Publishing House: V.I. Peckovs'kyy; Tech. Ed.: V.I. Yurchyshyn.

PURPOSE: The collection is intended for metallurgical engineers desiring information on fatigue and corrosion.

COVERAGE: The collection of 15 articles in Ukrainian compiled by 9 authors engaged in fatigue and corrosion research, is devoted to the subject of engineering practices in testing the fatigue properties of metals, mainly steel, with a particular emphasis on the phenomenon of corrosion fatigue and the effect of various liquid media upon such fatigue. Methods of investigation are described

Card 1/5

Physical, Chemical, and Mechanical (Cont.)

SOV/2610

and the results evaluated. The collection is dedicated to the sixtieth anniversary of the Academician Petro Oleksandrovych (Petr Aleksandrovich) Rebinder, an eminent metallurgist. The tests were conducted at the Instytut budiveln'noyi mekhaniky (Structural Mechanics Institute), Kiyev, Instytut mashynoznavstva ta avtomatyky (Machine-building and Automation Institute), L'viv, both under the sponsorship of the Ukrainian Academy of Sciences, and at the Politekhnicnyi Instytut (Polytechnical Institute), Khar'kov. References follow each article.

TABLE OF CONTENTS:

|   |    |
|---|----|
| Introduction  | 3  |
| Rebinder, P.O. On Physicochemical Mechanics   | 7  |
| <u>Karpenko, H.V.</u> Effect of Environment on the Strength of Metals   | 17 |
| Afendyk, L.H. Deformation Anisotropy of Mechanical Properties of Steel in Certain Nonuniform Processes of Plastic Deformation | 23 |
| Card 2/5  |    |

|  |          |    |
|--|----------|----|
| Physical, Chemical, and Mechanical (Cont.)   | SOV/2610 |    |
| Karpenko, H.V. New Concepts on the Mechanism of Corrosion Fatigue  |          | 47 |
| Yanchyshyn, F.P. Effect of Agressive Liquid Media on the Fatigue Strength of Steel Subjected to Stress Concentrations                                |          | 53 |
| Yatsyuk, A.I. Absence of Direct Relationship Between the Fatigue Strength and Corrosion Resistance of Steel  |          | 75 |
| Karpenko, H.V. and F.P. Yanchyshyn. Effect of the Tapping Temperature of 40KH Steel Upon its Corrosion Resistance and its Corrosion-Fatigue Strength |          | 83 |
| Stepurenko, V.T. Corrosion Resistance of "45" Steel  |          | 88 |
| Stepurenko, V.T. Corrosion-Fatigue Strength of "45" Steel in Hydro-sulphuric Solutions [Acid]  |          | 97 |

Card 3/5

Physical, Chemical and Mechanical (Cont.)

80V/2610

|  |     |
|--|-----|
| Yanchyshyn, F.P. Nature of Fatigue Failure of Induction-hardened specimens of "45" Steel with Stress Raisers             | 106 |
| Chayevs'kyy, M.Y. Brittleness of Low-carbon Steel Caused by the Action of Hydrogen                                       | 112 |
| Chayevs'kyy, M.Y. Effect of Molten Tin Upon the Fatigue Strength of Steel  | 116 |
| Tynnyy, A.N. Effect of Sulphiding by the MAZ [Minsk Motor-vehicle Plant] Method on the Wear-resistance of Iron and Steel | 123 |
| Chayevs'kyy, M.Y. A Machine for Fatigue Testing in Certain Liquid Media  | 134 |

Card 4/5

Physical, Chemical, and Mechanical : (Cont.)

SOV/2610

Yatsyuk, A.I., V.T. Stepurenko, and F.P. Yanchyshyn, Methods of  
Investigating the Fatigue Strength of Metals in Aggressive Liquid  
Media with the NU Testing Machine

140

AVAILABLE: Library of Congress (TA465.A42)

Card 5/5

TM/gmp  
12-22-59

21-1-8/26

AUTHORS: Karpenko, G.V., and Kripyakevich (Kryp'yakevych), R. I.

TITLE: On the Effect of Hydrogen on Strained Steel (O deystvii vodoroda na deformiruyemuyu stal')

PERIODICAL: Dopovidi Akademii Nauk Ukrain's'koi RSR, 1958, # 1, pp 37-40 (USSR)

ABSTRACT: The authors carried out experiments for studying an effect of hydrogen in the deformation process of soft steel on its mechanical properties. A special accessory to the IM-12 research tensile machine made it possible to place a steel sample being stretched at a constant rate into an electrolyte and apply a cathode or anode potential to it.

Observations have shown that the samples of steel 3 did not lose their plasticity and did not change other mechanical properties on applying anode potential, although they became covered with thin films of oxides during the experiment. However, on applying cathode potential, the steel samples lost plasticity and broke along the planes of shift. Mechanical properties of the cathode-polarized samples altered considerably, in particular, indices of plasticity and real breakdown stress. The limit of durability and yield point remained practically unaltered independent of the type of electrolyte,

Card 1/2

On the Effect of Hydrogen on Strained Steel

21-1-8/26

anode material and density of current. Experiments have shown that the variation of mechanical properties of the cathode-polarized samples depended primarily upon the density of current and only insignificantly upon the anode material. Results of experiments have been compiled into a table, and the dependence of some properties on the current density is shown by the graphs in Figure 2 of the article. It is concluded that in the process of steel deformation, its saturation with hydrogen occurs along the shift lines during galvanization.

The article contains 1 photo, 1 graph, 1 table and 1 Russian reference.

ASSOCIATION: Institute of Machine Study and Automation (Instytut mashynoznavstva i avtomatyky AN URSR) of the Ukrainian Academy of Sciences

PRESENTED: By Academician of the Ukrainian Academy of Sciences Yu.K. Delimarskiy (Delimars'kyi)

SUBMITTED: 24 June 1957

AVAILABLE: Library of Congress

Card 2/2      1. Steel-Deformation-Physical factors    2. Steel-Test methods  
3. Steel-Test results



KARPENKO, G.V. [Karpenko, H.V.] (L'vov); KRIPYAKEVICH, R.I. [Kryp'iakevych, R.I.]  
(L'vov)

Effect of the polarization of steel subjected to deformations on its  
mechanical properties. Prikl. mekh. 4 no.4:376-383 '58.  
(MIRA 11:12)

1. Institut mashinovedeniya i avtomatiki AN USSR.  
(Steel--Testing)

AUTHORS: Karpenko, G. V., Kripyakevich, R. I. SOV/20-120-4-38/67

TITLE: The Influence of the Polarization of Steel on Its Mechanical Properties (Vliyaniye polyarizatsii stali na yeye mekhanicheskiye svoystva)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 4, pp. 827 - 829 (USSR)

ABSTRACT: The authors in various electrolytes investigated the influence of the polarization of steel on its mechanical properties. A special device in the tensile-testing machine IM - 12 made the disruption of steel samples in an electrolyte possible when these steel samples are anodically or cathodically polarized by external power supplies. Besides, the mechanical properties of steel can be determined in this manner during the process of polarization. The authors examined soft annealed steel-3 with a perlite-ferrite structure in order to be able to observe the decrease in plasticity. Aqueous solutions of sulfuric acid, sodium hydroxide, or NaCl served as electrolytes. The current density in polarization varied from 0 to  $\pm 60$  ampères/dm<sup>2</sup>. The breaking test was carried out at a constant velocity of ex-

Card 1/3

The Influence of the Polarization of Steel on Its  
Mechanical Properties

SOV/20-120-4-38/67

tension of  $V = 2$  mm/min, and the current was applied simultaneously with the starting up of the tensile-testing machine. The soft annealed steel-3 on the occasion of its stretching in air had a distinct flow surface, a considerable elongation, a lateral constriction, and even flow figures. The same phenomena were observed on the occasion of the stretching samples with the same velocity in an electrolyte without polarization by an external power supply and also in an electrolyte with anodic polarization of the stretched sample. A brittle destruction existed in cathodically polarized samples mainly along the planes of the maximum tangential tensions (along the flow figures). On the occasion of the cathodic polarization of the samples the indices of plasticity  $\delta_{10}$  and  $\psi$  and the actual breaking tension decreased in a particularly high degree. Anodic polarization has no influence on the mechanical properties of steel. The phenomena in cathodic polarization are apparently due to hydrogen occlusion (navodorazhivaniye) which makes the stretched steel samples brittle. There are 3 figures and 1 table.

Card 2/3

4

- The Influence of the Polarization of Steel on Its Mechanical Properties

SOV/20-120-4-38/67

- ASSOCIATION: Institut mashinovedeniya i avtomatiki Akademii nauk USSR  
(Institute of Mechanical Engineering/Automation AS UkrSSR)

PRESENTED: January 24, 1958, by P. A. Rebinder, Member, Academy of Sciences, USSR

SUBMITTED: January 23, 1958

1. Steel--Mechanical properties
2. Steel--Polarization
3. Polarization--Metallurgical effects

Card 3/3

KARPENKO, G. V.

Distr: 4820/4843  
4F1

✓ Mechanism of the effect of the surrounding medium on metals. G. V. Karpenko (Inst. Maschinennide. Akad. Nauk SSSR, Moscow, U.S.S.R.). 21. 1972. 120p. (Lening.) 404. 200-18 (1968). — The primary effect of the surrounding medium on a solid body is adsorption, which occurs not only on the surface of the body but also on the surface of inner deficiency places to which the attacking medium may have access by diffusion. Thus, there is interaction with a relatively great vol. of the body, which explains, for example, the rapid and strong effect of chem. agents on the strength of a metal. Regions with accumulated deficiency places, e.g. the sliding planes of a worked metal and surface defects, therefore, strongly favor the attack of a medium. Thus, tension expts. were conducted on samples of mild steel 10 mm. in diam. which formed cathodes and anodes in an electrolyte soln., with a c.d. of 65.5 amp./sq. dm. Brittle rupture occurred along the sliding planes of the cathode, whereas the anodic samples (where no H<sub>2</sub> was formed) did not lose strength and plasticity as compared with samples tested in air. Friedrich Benzel

7  
3

11

EM

pp

adp

KARPENKO, G.V.

PHASE I BOOK EXPLOITATION

SOV/3631

Karpenko, Heorhyy Vladymyrovych

Koroziyna vtoma stali (Corrosion Fatigue of Steel) Kyiv, Vyd-vo AN URSR, 1959.  
175 p. Errata slip inserted. 1,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva  
i avtomatyky.

Resp. Ed.: I.I. Ishchenko, Candidate of Technical Sciences;  
Ed. of Publishing House: I.V. Kisina; Tech. Ed.: M.I. Yefimova.

PURPOSE: This book is intended for engineers and scientists working in the field  
of chemical machinery building and also for operators of machines and equip-  
ment at chemical plants.

COVERAGE: The book discusses the phenomenon of brittle fracture in steel due to  
the long-time action of corrosive environment and static or cyclic stresses.  
On the basis of the adsorption electrochemical theory of corrosion fatigue a  
new explanation of brittle fracture in steel is presented. The book is based  
on investigations made by the author and his coworkers. Corrosion fatigue

Card 1/4

Corrosion Fatigue of Steel

SOV/3631

phenomena are discussed in the light of the theory of physicochemical mechanics of metals. Acknowledgements are made to A.I. Yatsyuk and V.T. Stepurenko for the use of their materials in preparing the book. There are 157 references: 113 Soviet, 24 English, 17 German, and 3 French.

TABLE OF CONTENTS:

|   |    |
|---|----|
| Foreword  | 3  |
| Introduction  | 5  |
| I. Environment and Its Properties   | 8  |
| 1. Classification of media according to their effect on the strength and resistance of steels       | 8  |
| 2. Corrosive media  | 9  |
| II. Steel and Its Properties  | 19 |
| 1. On the structure of steel  | 19 |
| 2. Physicochemical properties of steel significantly affecting its interaction with the environment | 26 |

Card 2/4

Corrosion Fatigue of Steel

SOV/3631

|  |     |
|--|-----|
| III. Fatigue of Steel  | 39  |
| 1. Fatigue of steel due to prolonged action of static and cyclic stresses  | 39  |
| 2. Effect of surrounding medium on the fatigue of steels   | 51  |
| IV. Experimental Methods of Investigating Corrosion Resistance and Fatigue of Steel From Static and Cyclic Stresses in Corrosive Media | 66  |
| 1. Methods of investigating corrosion resistance of steel  | 67  |
| 2. Methods of investigating corrosion fatigue  | 69  |
| 3. Preparation of test specimens   | 79  |
| V. Results of the Investigation of Corrosion Fatigue   | 89  |
| 1. Character of steel fracture from corrosion fatigue  | 89  |
| 2. Shapes of fatigue curves  | 98  |
| 3. Effect of the properties of corrosive media   | 103 |
| 4. Effect of the structure of steel  | 110 |
| 5. Effect of stress concentration  | 117 |
| 6. Effect of strain hardening and residual stresses  | 128 |
| 7. Effect of subsurface layers in steel  | 142 |

Card 3/4



Corrosion Fatigue of Steel

SOV/3631

|  |     |
|--|-----|
| 8. Size effect   | 149 |
| VI. Mechanism of Corrosion Fatigue   | 156 |
| 1. Adsorption electrochemical theory of corrosion fatigue of steels        | 156 |
| 2. Mechanism of corrosion fatigue under static stresses (corrosion cracks) | 168 |
| References   | 171 |
| AVAILABLE: Library of Congress   |     |

Card 4/4

VK/wbc/gmp  
7-8-60

25(1); 18(7)

PHASE I BOOK EXPLOITATION

SOV/2426

Karpenko, Georgiy Vladimirovich, Doctor of Technical Sciences, Professor

Vliyaniye mekhanicheskoy obrabotki na prochnost' i vyнослиvost' stali (Effect of Machining on the Strength and Fatigue Resistance of Steel) Moscow, Mashgiz, 1959. 184 p. 5,000 copies printed.

Reviewer: V. I. Likhtman, Doctor of Physical and Mathematical Sciences, Professor; Ed. of Publishing House: P.Ya. Furer; Chief Ed. (Southern Division, Mashgiz): V.K. Serdyuk, Engineer.

PURPOSE: This book is intended for engineers, technicians, and scientists working in the field of machine manufacturing.

COVERAGE: The book presents basic information on the strength and fatigue resistance of steel, and methods of testing for these characteristics under the action of various external media. In addition, the author discusses how, in the presence of these media, the strength and fatigue resistance of steel are affected by the condition of the surface and subsurface layers and by changes resulting from machining (turning, grinding, burnishing). S. V. Serensen,

Card 1/4

Effect of Machining on the Strength (Cont.)

SOV/2426

I. A. Oding, and Ye.M. Shevandin are mentioned in connection with their studies of the effect of machining on fatigue strength, in particular, the effect of microgeometry and the state of the subsurface layer. Personalities mentioned for contributions in related fields are: P.Ye. D'yachenko, A.I. Isayev, V.A. Krivoukhov, L.A. Glikman, B.I. Kostetskiy, A.A. Matalin, and M.O. Yakobson. There are 157 references: 119 are Soviet, 20 German, and 18 English.

TABLE OF CONTENTS:

|  |    |
|--|----|
| Introduction   | 3  |
| 1. Basic Concepts of Strength and Fatigue Resistance of Steel  | 6  |
| Strength of steel  | 6  |
| Fatigue resistance of steel  | 18 |
| 2. Some Questions of Method in the Testing of Steel for Strength and Fatigue Resistance Under the Action of External Media   | 34 |
| 3. Effect of Active External Media on the Strength and Fatigue Resistance of Steel   | 51 |
| Classification of external media according to the predominant type of action on the strength and fatigue resistance of steel | 51 |

Card 2/4

Effect of Machining on the Strength (Cont.)

SOV 2426

|   |     |
|---|-----|
| Initiation of the action of the medium under the influence of deformation.<br>Universality of the role of metal defects and of adsorption from the<br>external medium | 52  |
| Effect of active media on the strength of steel   | 59  |
| Effect of active media on the fatigue resistance of steel   | 74  |
| 4. Effect of the Condition of the Surface and Subsurface Layers of the<br>Steel on Its Strength and Fatigue Resistance  | 89  |
| Effect of microgeometry   | 89  |
| Effect of work hardening  | 107 |
| Effect of residual stresses   | 115 |
| 5. Effect of Machining Parameters on the Quality of the Surface and<br>Subsurface Layers of the Steel   |     |
| Turning on lathes   | 122 |

Card 3/4

Effect of Machining on the Strength (Cont.)

SOV/2426

|                   |     |
|-------------------|-----|
| Grinding          | 132 |
| Finish grinding   | 135 |
| Polishing         | 135 |
| Roller burnishing | 136 |

|  |     |
|--|-----|
| 6. Effect of Turning, Cylindrical Grinding, and Roller Burnishing<br>on the Strength and Fatigue Resistance of Steel | 139 |
|--|-----|

|            |     |
|------------|-----|
| Conclusion | 178 |
|------------|-----|

|            |     |
|------------|-----|
| Literature | 181 |
|------------|-----|

AVAILABLE: Library of Congress

JO/fal  
10-20-59

Card 4/4

32618

S/137/61/000/011/076/123

A060/A101

18.8300

1496

AUTHOR: Karpenko, G.V.

TITLE: On the problem of the crushing mechanism of stressed metal under the action of molten metal

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no.11, 1961, 36, abstract 11Zh218 ("Byul. In-t metallokeram. i spets. splavov AN USSR", 1959, no. 4, 79 - 85)

TEXT: The author discusses the results of experiments carried out for the purpose of clarifying the action of molten metal upon the strength characteristics of metal in the solid state. A diffusion hypothesis is developed for the crushing of stressed metal under the action of molten metal, complemented by considerations of the absorption effect and of the interaction of the molten metal with large volumes of the stressed metal through defects in the latter. On the basis of experimental results it is concluded that the lowering of the ductility, strength, and endurance of the metal under the action of a surface-active, corroding medium, or a medium diffusing into the metal lattice, proceeds only in the case of interaction of that medium with a considerable volume of the metal. This is possible

Card 1/2

66895

18.8200

SOV/126-8-1-13/25

AUTHORS: Karpenko, G. V. and Kripyakevich, R. I.

TITLE: Effect of Hydrogen Diffusion, Occurring During Deformation<sup>26</sup>  
of Steel, on the Mechanical Properties of the Latter

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 1,  
pp 90-94 (USSR)

ABSTRACT: A special attachment to the tensile testing machine IM-12 (Fig 1) enabled a steel specimen to be fractured in an electrolyte during application of a cathodic or anodic potential from an external source of current. This attachment also enabled the mechanical properties of the steel and the kinetics of the hydrogen diffusion to be determined when the elongated specimen was made the cathode, and it was possible to change the anode material as well as the composition of the electrolyte and the current density. Finally this attachment enabled steel specimens to be studied during their anode polarization. In order to be able to observe the decrease in plasticity the experiments were carried out with the soft annealed steel St.3 having a pearlite-ferrite structure. Specimens of 10 mm diameter and a working portion length of 100 mm, Card 1/4 were washed with aviation benzene and desorbed with

66855

SOV/126-0-1-13/25

Effect of Hydrogen Diffusion, Occurring During Deformation of Steel, on the Mechanical Properties of the Latter

activated carbon prior to testing. Soft steel St.3, lead, copper and graphite were used as anode material. An aqueous 26% sulphuric acid solution (s.g. 1.18) and an 18% aqueous solution of caustic soda were used as the electrolytes. The current density changed due to polarization from 0-60 amps/dm<sup>2</sup>. Tests were carried out at a constant rate of  $v = 2$  mm/min. The current was switched on and the tensile testing machine was started simultaneously. The electrolyte was poured in immediately before the beginning of the test (an average of 4 min passed between the beginning of the electrolyte pouring and the beginning of the test). The entire test lasted from 10-15 min. The aim of the test was to determine the UTS ( $\sigma_{UTS}$ , kg/mm<sup>2</sup>), the yield stress ( $\sigma_{yield}$ , kg/mm<sup>2</sup>), the true stress during fracture ( $\sigma_{true}$ , kg/mm<sup>2</sup>), percentage elongation ( $\delta_{10\%}$ ) and the percentage reduction in area ( $\psi\%$ ) of the steel during the polarization process. In Fig 2 the influence of polarization of steel St.3 on the nature of the stress-strain curves is shown; a - in 4

Card 2/4



66815

SOV/126-8-1-13/25

Effect of Hydrogen Diffusion, Occurring During Deformation on Steel, on the Mechanical Properties of the Latter

air,  $\delta$  - during anodic polarization,  $\nu, g, d$  - during cathodic polarization. The anode material was iron. Fig 3 shows specimens of steel St.3 fractured under various conditions: a - in air, b - during anodic polarization and B - during cathodic polarization. In Fig 4 the dependence of  $\psi$  on current density is shown: a - copper anode, acid electrolyte; b - lead anode, acid electrolyte; B - iron anode, acid electrolyte;  $\gamma$  - graphite anode, acid electrolyte and d - lead anode, alkaline electrolyte. The table on p 92 gives mechanical properties of steel St.3 as determined by tests carried out in air and in an electrolyte at the optimum current density at which the greatest changes in mechanical properties of the steel were observed. The authors arrive at the following conclusions:  
1) The influence of hydrogen on soft steel during its deformation by straining consists in decreasing the plasticity,  $\psi$  and  $\delta$ , and the true stress on fracturing.

Card 3/4  $\sigma_{true}$ . The UTS and yield stress do not change. 4

66895

SOV/126-8-1-13/25

Effect of Hydrogen Diffusion, Occurring During Deformation on Steel, on the Mechanical Properties of the Latter

2) The effect of the influence of hydrogen on the above mechanical properties of steel depends on the current density, and it becomes evident at certain optimum current density values.

3) The fracture of cathodically polarized specimens during elongation is brittle in nature and occurs essentially along planes of maximum tangential stresses (along slip lines).

There are 4 figures, 1 table and 4 references, 3 of which are Soviet and 1 French.

ASSOCIATION: Institut mashinovedeniya i avtomatiki AN UkrSSR  
(Institute of Machine Construction and Automation,  
Ac.Sc., UkrSSR)

SUBMITTED: June 13, 1957

Card 4/4

SOV/5239

PHASE I BOOK EXPLOITATION

Karpenko, <sup>Georgiy Vladimirovich</sup>  
~~Georhyy~~ Volodymyrovych

Vplyv vodnyu na mekhanichni vlastyvosti stali (Influence of Hydrogen on the Mechanical Properties of Steel) Kyiv, Vydavnytstvo AN Ukr. RSR, 1960. 69 p. 1,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrayins'koyi RSR. Instytut mashy-noznavstva i avtomatyky.

Resp. Ed.: R. I. Kryp'yakevych, Candidate of Technical Sciences;  
Ed. of Publishing House: I. V. Kisina; Tech. Ed.: O. O. Kadashevych.

PURPOSE: This booklet is intended for engineers and scientific workers in the field of chemical machine building.

COVERAGE: The effect of hydrogen on the mechanical properties of steel is discussed from the standpoint of the physicochemical treatment of materials and the theory of dislocation. The author presents a new interpretation of the mechanism of hydrogen

Card ~~1/4~~

S/021/63/000/006/012/019  
A153/A029

AUTHORS: Karpenko, G.V.; Stepurenko, V.T.

TITLE: The Influence<sup>18</sup> of Hydrogen Sulfide<sup>1</sup> on the Plasticity of Steel

PERIODICAL: Dopovidi Akademiyi nauk Ukrayins'koyi RSR, 1960, Nr. 6, pp. 791 - 794

TEXT: <sup>1</sup> A study was made to find out the primary causes of the intensive corrosion and the decrease of the plasticity of steels, either due to the anodic processes or the cathodic processes occurring in steels subjected to the effects of humid hydrogen sulfides or aqueous solutions of H<sub>2</sub>S. A theoretical explanation of the essence of the above processes is given. It is stated that water saturated with hydrogen sulfide decreases the plasticity of steel not because of anodic processes (formation of a rust layer), but owing to cathodic processes, which produce a hydrogenation of steel. Hydrogen desorption almost fully restores the plastic properties of steel. Cathodic steel polarization in water containing hydrogen sulfide considerably increases the loss of the plasticity of steel. Anodic polarization retains the initial plasticity of steel in hydrogen sulfide

Card 1/2

S/021/60/000/006/012/019  
A153/A029

The Influence of Hydrogen Sulfide on the Plasticity of Steel

water. Two mm wires made of Y-7 (U-7)<sup>b</sup> steel, containing 0.65% C, 0.4% Mn, 0.22% S were investigated. Figure 1 shows the dependence of the plasticity of steel on the concentration of H<sub>2</sub>S and the time of submersion in hydrogen sulfide solution. There are 4 figures. ✓

ASSOCIATION: Instytut mashynoznavstva i avtomatyky AN UkrSSR (Institute of the Science of Machines and Automation of the AS UkrSSR)

PRESENTED: by Yu.K. Delimars'kyi, Academician, AS UkrSSR

SUBMITTED: December 17, 1959

Card 2/2

KARPENKO, G.V. [Karpenko, H.V.] (L'vov)

New ideas on the effect on hydrogen on properties of steel.  
Prikl.mekh. 6 no.4:361-367 '60. (MIRA 13:11)

1. Institut mashinovedeniya i avtomatiki AN USSR.  
(Steel—Hydrogen content)

KARPENKO, G.V.

Mechanism of changes in the mechanical properties of steel caused  
by hydrogen. Nauch.zap.IMA AN URSR. Ser.mashinoved. 7 no.6:61-63  
'60. (MIRA 13:8)

(Steel--Hydrogen content)

KARPENKO, G.V., STEPURENKO, V.T.

Effect of the nature of a corrosion medium on corrosion and  
corrosion-fatigue resistance of steel. Nauch.zap.IMA AN URSS.  
Ser.mashinoved. 7 no.6:64-69 '60. (MIRA 13:8)  
(Steel--Corrosion)



S/032/60/026/009/010/018  
B015/B058

AUTHOR: Karpenko, G. V.  
TITLE: Influence of the Working Medium on the Appearance of the Scale Effect ✓  
PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 9, pp. 1134 - 1135

TEXT: As far back as 1953 (Ref. 1), the author showed that in bending experiments on samples of 20X (20Kh) steel with a perlite-ferrite structure, in a corrosive medium such as water, the scale effect is inverse to that obtained with experiments in the air. Experiments conducted in the air, in oleic acid-containing oil and river water showed (Fig., diagrams of the dependence of the scale-effect coefficient on the sample diameter) that with an increase of the sample diameter, the durability of the sample decreases in the air, while it increases in water and also decreases in activated oil, but much more slowly than in the air. Since these results contradict those by McAdam (Ref. 3), L. A. Glikman et al (Ref. 4) experimentally checked the results by the author and McAdam ✓

Card 1/3

Influence of the Working Medium on the  
Appearance of the Scale Effect

S/032/60/026/009/010/018  
B015/B058

and established that the contradiction must be explained by the duration of the test, i.e., that an inversion of the scale effect occurs with regard to experiments in the air on a sufficiently prolonged action of the corrosion medium. This phenomenon is explained by the author by varying effects on the layer below the metal surface, i.e., a corrosive medium weakens this layer, the weakening being relatively greater for samples with small diameter than for those with a large diameter. Consequently, the fatigue limit increases with an increase of the sample size. Every factor leading to a reduction of the faultiness of the metal layer mentioned, is bound to favor the appearance of the scale effect. Since the weakening of the metal layer in the surface-active oil medium was considerably smaller than in water, the appearance of the scale effect could not be completely eliminated, but it was weakened. For media in which durability increases, it may be expected that a scale effect appears in the case of a technical treatment, where a strengthening of the layers below the metal surface is achieved. There are 1 figure and 4 references:  
3 Soviet and 1 US.

Card 2/3

KARPENKO, G.V., otv. red.; LEONOV, M.Ya., doktor fiz.-mat. nauk, zam. otv. red.; KRIPYAKEVICH, R.I., kand. tekhn. nauk, red.; MAKSIMOVICH, G.G., kand. tekhn. nauk, red.; PANASYUK, V.V., kand. fiz.-mat. nauk, red.; PODSTRIGACH, Ya.S., kand. fiz.-mat. nauk, red.; STEPURENKO, V.T., kand. tekhn. nauk, red.; TYNNYI, A.A., kand. tekhn. nauk, red.; CHAYEVSKIY, M.I., kand. tekhn. nauk, red.; YAREMA, S.Ya., kand. tekhn. nauk, red.; RENENNIK, T.K., red. izd-va; LISOVETS, A.M., tekhn. red.

[Machines and devices for testing metals] Mashiny i pribory dlia ispytaniy metallov. Kiev, Izd-vo Akad.nauk USSR, 1961. 132 p.  
(MIRA 15:2)

1. Akademiya nauk URSR, Kiev. Instytut mashinoznaystva i avtomatyky. 2. Chlen-korrespondent Akad. nauk USSR (for Karpenko).  
(Testing machines)

S/735/61/000/000/001/014

AUTHOR: Karpenko, G.V.

TITLE: Fundamentals of endurance and fatigue testing of metals in active media.

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut mashinovedeniya i avtomatiki. Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 5-10.

TEXT: Specific considerations are expounded concerning the effect of the surrounding medium by corrosion, diffusion, radiation, erosion, or cavitation on both the static endurance and the cyclic fatigue strength of solid bodies. Media which effect a significant lowering of the level of surface energy by adsorption may act rapidly, e.g., through a lowering of the plasticity of a metal tested at rates of deformation of mm/min (cf., e.g., Labzin, V.A., Likhtman, V.I., Akad.n. SSSR, Dokl., v. 129, no. 3, 1959; Kosogovo, G.F., Likhtman, V.I., ibid., v. 134, no. 1, 1960). Fast-acting media contain H, the active form of which, proton gas, acts so swiftly that only in exceedingly rapid processes, such as impacts, is the strength of the material tested not affected thereby (cf. Karpenko, G.V., Vplyv vodnyu na mekhanichni vlastivosti stali - The effect of water on the mechanical properties of steel, Vyd-vo AN URSS, 1960). Thus, some effect of the external medium is always experienced in static endurance and cyclic fatigue tests. This effect is ordinarily a weakening one (cf. Karpenko, G.V., Vliyaniye aktivnykh zhidkikh sred na vynoslivost' stali - The effect of active fluid media on the strength of steel. Moscow. Mashgiz, 1955); liquid Sn and its toughening effect on cyclically-tested steel is an example of the opposite effect

Card 1/3

Fundamentals of endurance and fatigue testing...

S/735/61/000/000/001/014

(cf. Chayevskiy, M.I., Akad.n. SSSR, Dokl., v. 129, no. 5, 1959). In martensite-like non-equilibrium structures corrosional media may lower the fatigue limit by tens of times. Erosion- and cavitation-active media impair fatigue strength usually by the creation of stress-concentrators. Neutron-radiating media may increase the fatigue strength over the short term, but lower it in the long run. Media that dissolve the structural material weaken it usually, e.g., in the action of some liquid-metal fusions on ferritic alloys. Media that form compounds with the structural material may strengthen or weaken it thereby, but even if the ultimate product is weaker than the initial material, the formation in the surficial layer of residual compressive stresses may produce a net strengthening effect; example: The effect of liquid metallic Sn or the Pb-Sn eutectic on steel (cf. Chayevskiy, M.I., Akad.n. SSSR, Dokl., v. 134, no. 6, 1960). To establish order among the many seemingly contradictory physical, physico-chemical, electrochemical and other effects, certain basic media and materials factors can be identified. Adsorption, preceding corrosion and diffusion phenomena, is a universal factor. Adsorption of surface-active elements lowers the surface energy of a solid and weakens it, at times to the point of reducing the metal to colloidal particles, as is observed in tests with Zn single crystals covered with liquid Ga (Shchukin, Ye.D., et al., Kristallografiya, v. 4, no. 6, 1959). Some weakly surface-active media, however, may even strengthen a metal (cf. Maksimov, G.G., et al., in Sbornik "Voprosy mashinovedeniya i prochnosti v mashinostroyeni," no. 7, 1961). Adsorption effects occurring at the interface

Card 2/3

Fundamentals of endurance and fatigue testing...

S/735/61/000/000/001/014

between the metallic body and the medium soon penetrate through surface defects and by diffusion along the inner interfaces of the surface-active phases dissolved in the solid. The result is "adsorption fatigue" (Karpenko, G. V., Prikladnaya mekhanika, v.3, no.1, 1957). Another universal factor affecting the interaction of cyclically stressed materials with surrounding media is the presence of a variety of statistically distributed defects (from ultramicroscopic to macroscopic), including dislocations and vacancies, variations in surface-tension gradients, etc.; the Rebinder effect is cited (Rebinder, P. A., Zeits. f. Phys., v. 72, 1931, 191, and in Yubilneyyy sbornik, posvyashchennyy Oktyabr'skoy revolyutsii, Izd-vo AN SSSR, v.1, 1947, 123). The activation of a solid body under deformation, which reduces the activation increment required of the external medium to produce a weakening effect. Uneven action by the medium due to uneven deformative activation of the metal facilitates the weakening effects; hence, the pre-test treatment of the specimen may have a decisive effect on its fatigue strength. The "inherited" effects of machining, etc., may facilitate the attack by an active medium; on the other hand, any cold-hardening finishing operation which suppresses the changes caused by antecedent cutting operations, will exert a protective effect. There are 19 Soviet references, of which 18 are Russian-language and 1 German-language.

ASSOCIATION: None given.

Card 3/3

S/723/61/000/001/001/005

**AUTHORS:** Karpenko, G.V., Kripyakevich, R.I.

**TITLE:** Modern concepts on the effect of H on the properties of steel.

**SOURCE:** Vliyaniye rabochikh sred na svoystva stali. vyp. 1: Sredy, vyzyvayushchiye navodorozhivaniye stali. In-t mash. i avtom. AN UkrSSR. Kiyev, Izd-vo AN UkrSSR, 1961, 5-21.

**TEXT:** The paper sets forth the extant basic theories on the effect of H on the properties of a steel, together with a critique and a presentation of the authors' concepts on this problem. The existing theories of hydrogen-embrittlement can be divided into 3 groups, each of which has a number of ramifications: (1) The H-molecular-pressure theory, including (a) the theory of the areal pressure, (b) the diffusion theory, (c) the energetic theory, (d) the theory of reversible and irreversible brittleness; (2) the adsorption theories; (3) the theory of the maximal triaxial stresses. The first concepts are discussed in the light of the Zapffe-Sims theory, the Cottrell-Barrett concepts, the Bastien-Azou concepts, the DeKazinczy theory, the Soviet Moroz-Mingin views, and others. The critique of the pressure theory follows 2 lines: On the one hand, the position taken by the originators of that theory disregards the effect of diffusion processes on the mechanism of H-embrittlement and attempts to attribute it strictly to the pressure in the collectors. On the other hand, it can be

Card 1/2

Modern concepts on the effect of H on the ....

S/723/61/000/001/001/005

reasoned that, according to the combined pressure and diffusion theories, the pressure of the molecular H in the collectors must evoke, firstly, a decrease in tensile strength and, secondly, a decrease in plasticity of the steel. By vector analysis it can be shown that a reduction in plasticity alone can reduce the external force required for tensile fracture. However, the reduction in plasticity of the steel cannot be attributed solely to the action of the internal pressure in the collectors. A survey of this line of criticism is set forth. A further review of the other theories of H-embrittlement follows, utilizing primarily Western sources. Following a presentation of the theory of the mechanism of the reversible and irreversible H-embrittlement, it is stated that experiments performed by the junior author (see Abstract S/723/61/000/001/002/005) confirm that theory. The intensification of the H-embrittlement effect in steel, under conditions of hydrogenation during the process of deformation of a specimen, is attributed to the more economical utilization in that process of the available H than in the case of a deformation following an antecedent hydrogenation. Crack formation is achieved by a negligible amount of H in the near-surficial specimen layer. As the specimen is further stretched, the H that is supplied to the specimen continuously from the environment succeeds in diffusing toward the root of the crack and thereby facilitates its further development. Further reasonings in favor of the reversible-irreversible H-embrittlement are adduced. There are 5 figures and 37 references (15 Russian-language Soviet, 18 English-language, 3 French, 1 German).

Card 2/2



S/735/61/000/000/003/014

AUTHORS: Chayevskiy, M.I., Popovich, V. V., Karpenko, G. V.

TITLE: A machine for the investigation of elastic-plastic torsional deformations.

SOURCE: Akademiya nauk Ukraineskoy SSR. Institut mashinovedeniya i avtomatiki. Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 19-25.

TEXT: The design of a machine for torsional testing of steel specimens at high temperatures (T), in contact with various fluid media, and with large cyclic deformations, is described. Test data for normalized steel "50" at room temperature are adduced. The machine was developed to provide an experimental means for a determination of whether or not to include cyclically alternating torsional-stress conditions implying elastic-plastic deformation as reasonable design conditions for certain power-plant elements, such as tubes and boilers, which may undergo a relatively small number of such cycles in their operational life span. The vertically oriented specimen is clamped rigidly at its lower end. The upper, rotatable, strain-gage-dynamometer clamp is twisted by a 0.6-kw, 1410 rpm, reversible electric motor via a two-stage  $1:30 \times 1:64 = 1:1920$  worm-gear train (angular rate - 4.6 rad/min). The angular travel of the clamp is measured by a rheochord. The motor-reversal switch is actuated by travel-limiting stops for fixed-deformation tests and

Card 1/2

A machine for the investigation of elastic-plastic...

S/735/61/000/000/003/014

by strain-gage signals for fixed-torque tests (the strain gages are water-cooled to avoid temperature effects). The signals issuing from the rheochord and the strain gages are recorded by a coordinate recorder for the purpose of tracing the hysteresis loop (cf. Chayevskiy, M.I., in Zbornik "Temperaturni napruzhyennya v tonkostinnykh konstruktsiyakh - T stresses in thin-walled structures." Vyd-vo AN URSSR, 1959). During fixed-torque tests the signals issuing from the strain gages are fed into a bridge circuit, the unbalance of which energizes a reversible ПД-9 (RD-9) motor which drives both a balancing rheostat and a switch-actuating cam; vernier adjustments are available for enhanced precision, with reference to the extreme points of the recorded graph. A multisection resistance heater with 3-mm-dia NiCr wire coils maintains a T to within  $\pm 1^{\circ}\text{C}$  along the specimen with the aid of an ЭПВ-01 (EPV-01) potentiometer. A metal container embracing the specimen is used for tests in a fluid medium. A sample recording of a room-temperature test in air of a normalized steel-50 specimen shows that the first complete cycle results in a toughening of the metal and that subsequent cycles are practically stable, but are affected by some stress asymmetry. A summary graph for the same test shows the number of cycles to failure as a function of (1) the angle-of-twist amplitude and (2) the maximal tangential stresses, also (3) the plastic-deformation work A (kg/cm) as a function of the maximum tangential stress  $\tau$  (g/cm<sup>2</sup>). The latter curve is well approximated by  $A = (1/3) \cdot 10^{-6} \tau^6$ . There are 3 figures and 1 Ukrainian-language ASSOCIATION: None given. || Soviet reference.

Card 2/2

S/723/61/000/001/003/005

AUTHORS: Karpenko, G. V., Stepurenko, V. P.

TITLE: The effect of hydrogen-sulfide water on the mechanical properties of steel.

SOURCE: Vliyaniye rabochikh sred na svoystva stali. vyp.1: Sredy, vyzyvayushchiye navodorozhivaniye stali. In-t mash. i avtom. AN UkrSSR. Kiev, Izd-vo AN UkrSSR, 1961, 27-33.

TEXT: The paper reports experimental tests which show that the impairment of the mechanical properties of a steel during short-term soaking in  $H_2S$  water is attributable to hydrogenation and not to corrosion. Desorption of the H restores the initial mechanical properties of the steel almost fully. The investigation was performed on low- and medium-C steels in the form of 1-mm-diam wire (0.07% C, 0.47% Mn, 0.04% S, 0.007% P) and 2-mm-diam wire (0.67% C, 0.44% Mn, 0.029% S, 0.019% P). The wire specimens were degreased and immersed into water containing various amounts of  $H_2S$ . Escape of the  $H_2S$  during the immersion process was impeded by a 20-mm-thick oil layer floating atop the water. Following immersion for differing periods of time, bending and torsion tests were made on some of the specimens, while other specimens were subjected to drying for the purpose of aging.

Card 1/2

The effect of hydrogen-sulfide water on ....

S/723/61/000/001/003/005

followed by desorption of the H which had penetrated the steel by means of cathode processes in the  $H_2S$  water. The second group of specimens was then also tested for bending and torsion after a prescribed holding time in the drier at differing temperatures. The results of the tests are shown in the form of graphs of the flexural plasticity of the wire vs. time, for different flexural and torsional plasticity of the wire vs. time, for different  $H_2S$  concentrations, and it was found that: (1) Both the anodic and the cathodic process affect the mechanical properties of steels immersed in  $H_2S$  water; however, during short-term exposure of the specimens the impairment of the plastic properties occurs through hydrogenation of the cathodic regions only; (2) the losses in plasticity (the decrease in the number of flexural and torsional strains) of the steel specimens after immersion in the  $H_2S$  water increases with increasing concentration and with increasing exposure time of the specimen to the medium; (3) the effect of the  $H_2S$  water is more pronounced in the torsional tests than in the flexural tests; (4) desorption of the H restores the plastic properties of the steel almost fully; the higher the aging temperature, the faster the plasticity is restored. There are 7 figures and 2 references (1 Russian-language Soviet and 1 French-language original by Bastien-Amiot in Russian translation).

Card 2/2

KARPENKO, G.V.; STEPURENKO, V.T.

Effect of polarization on the plasticity of steel. Vliian.rab.  
sred.na svois.stali no.1:34-38 '61. (MIRA 15:5)  
(Steel—Corrosion) (Polarization (Electricity))

KARPENKO. G.V.; STEPURENKO. V.T.

Effect of preliminary hydrogen absorption on the corrosion  
resistance of steel. Vliian.rab.sred.na svois.stali no.1:39-44  
161. (MIRA 15:5)  
(Steel--Hydrogen content) (Steel--Corrosion)

S/735/61/000/000/005/014

AUTHORS: Maksimovich, G.G., Yanchishin, F.P., Popovich, V.V., Nagirnyy, S.V.,  
Karpenko, G.V.

TITLE: Machines for micromechanical endurance testing under variable tension  
in various media.

SOURCE: Akademiya nauk Ukrainskoy SSR. Institut mashinovedeniya i avtomatiki.  
Mashiny i pribory dlya ispytaniy metallov. Kiyev, 1961, 41-46.

TEXT: A machine is described in which inertial loading is used in the endurance testing of 1- to 3-mm dia microspecimens in various fluid media. Variable-tension testing methods are described, and test data reported on 1-mm dia steel-45 microspecimens in air, MC (MS) oil activated with 2% oleic acid, and a 3% watery solution of NaCl. Testing of microspecimens is attractive for the determination of the effect of environmental media on the static and cyclic fatigue strength of a material; in smaller specimens the ratio of the surface area to the cross-sectional area is greater than in large specimens. Testing machines for static microspecimen tests have been described elsewhere (cf. Roytman, I.M., Fridman, Ya.B. Mikromekhanicheskiy metod ispytaniya metallov - The micromechanical method of metals testing. Moscow. Oborongiz, 1950. Konoplenko, V.P., et al., Zavodskaya laboratoriya, v.25, no.1, 1959. Regel, V.R., et al., ibid.). Variable-load testing is well known for large specimens, but little has been done for the testing of 1- to 3-mm dia microspecimens because of the difficulties inherent in the over-all precision and especially the exact

Card 1/3

Machines for micromechanical endurance testing... S/735/61/000/000/005/014

centering required. In the authors' machine the specimen (surrounded by a beaker for tests in various fluid media) is suspended from an annular dynamometric holder equipped with surface wire strain gages. A prescribed weight, spring-suspended from the lower end of the specimen, constitutes the static tension load. Also suspended from the lower end of the specimen is a floating frame containing an eccentric weight which is flexible-shaft-driven by a 30-w d.c. motor at 3,000 to 10,000 rpm. A spring parallelogram attached to the vertical machine support absorbs any horizontal component of the vibration, and only the vertical component of the cyclic inertial load is borne by the specimen. A variable resistance in the feed circuit permits programmed variations in the inertial load. The strain-gage readings are taken on an MHO-2 (MPO-2) oscillograph. The annular dynamometer is precalibrated statically. The strain-gage signals are preamplified on a tensometric TY-6M (TU-6M) amplifier. All tests were made in tension only, the mean load (equal to the static load) was held constant or varied, and the inertial-load amplitude was held constant or varied. Test data on carbon steel "45" are reported. The static (or mean) tension was  $\sigma_m = 29.3 \text{ kg/mm}^2$ , the inertial load, with a frequency of 50 and 142 cps, was varied. Fatigue curves are shown. The fatigue limit at high stresses is found to be greater in fluid media than in air. At the 142-cps frequency the fatigue limit in air and in activated oil is attained at  $2.5 \cdot 10^7$  cycles. There is no noticeable effect of the activated oil on the fatigue limit on the basis of  $10^8$

Card 2/3



Machine for micromechanical endurance testing... S/735/61/000/000/005/014

cycles. The NaCl solution produced a continuous impairment of the fatigue limit. At 50 cps an analogous behavior is observed. The endurance limit in air and in activated oil is attained at  $8.5 \cdot 10^6$  cycles. NaCl reduces the fatigue limit continuously. There are 3 figures and 6 Russian-language Soviet references.

ASSOCIATION: None given.

Card 3/3

S/723/61/000/001/005/005

AUTHORS: Karpenko, G.V., Babey, Yu.I., Kripyakevich, R.I.

TITLE: On hydrogen fatigue of steel under cathodic protection.

SOURCE: Vliyaniye rabochikh sred na svoystva stali. vyp.1: Sredy, vyzyvayushchiye navodorozhivaniye stali. In-t mash. i aytom., AN UkrSSR, Kyev, Izd-vo AN UkrSSR, 1961, 59-64.

TEXT: An experimental investigation has shown that under cathodic protection of cyclically stressed steel parts their endurance is impaired because of the action of electrolytically penetrated H (the "H fatigue of steel"). It is established that this phenomenon is intensified with an increase in the current density of the cathodic polarization. When the current density is small, anodic corrosion processes occur. The development of H fatigue is impeded if the electrolyte is not sufficiently stirred, owing to the formation of an alkaline zone. A special equipment was constructed (cross-section shown) for the fatigue testing of a metal under simultaneous hydrogenation. This equipment was used in conjunction with the IMA-30 testing machine; it was constructed by the Institute of Machine Science and Automatics, AS UkrSSR, and was capable of testing 10-30-mm diam specimens by pure cyclic flexure during rotation. The specimens actually used had 20-mm diam in their working portion. They were made of steel 45 (0.45% C, 0.65% Mn, 0.34% Si, 0.035% S, 0.021% P).

Card 1/2

On hydrogen fatigue of steel under cathodic ....

S/723/61/000/001/005/005

0.03% Ni, 0.05% Cr,  $\sigma_b = 70 \text{ kg/mm}^2$ ,  $H_B = 207$ ). The corrosive medium tested was a 3% solution of NaCl in faucet water, which, to a degree, simulates sea water. The specimen served as the cathode, and a Pt anode was employed. The electrolyte was introduced under a small pressure, so that the working part of the specimen was fully immersed. Polarization was achieved through a rectifier and a rheostat, which provided a current density ranging from 0.007 to 6.2 amp/dm<sup>2</sup>. The tests in air were performed on a basis of  $10^4$  cycles and in the corrosive medium, at  $2 \cdot 10^7$  cycles. The values of the fatigue limit vs. the cathode current density are graphed, together with fatigue limit vs. the number of cycles, with the current density as a parameter. It was noted that there is an optimal current density (0.15 amp/dm<sup>2</sup> for the conditions of the present investigation), at which the anodic process comes to a total standstill and the fatigue strength attains a maximal value, which however is still 10% lower than in air, a phenomenon that is attributed to H fatigue. It is concluded that, in any stress analysis of parts that may have to operate under conditions similar to those tested, the effect of H fatigue should be taken into account, together with the specific conditions of the electrolyte exchange that may occur in the respective practical case. There are 3 figures and 6 references (5 Russian-language Soviet and 1 English-language: Evans, U.S., Metallic corrosion, passivity, and protection, 2d ed., London, Edward Arnold, 1946, in Russian translation).

Card 2/2

KARPENKO, G.V.; LITVIN, A.K.

Effect of hydrogen on the microhardness of structural components  
in low-carbon steel. Vliian.rab.sred.na svois.stali no.1:73-79  
'61. (MIRA 13:5)  
(Steel—Hydrogen content) (Hardness)